REMARKS

This application has been reviewed in light of the Office Action mailed on May 2, 2003. Claims 1-9 are pending in the application with Claims 1 and 9 being in independent form. By the present amendment, the drawings, the specification, and Claims 1-9 have been amended. No new matter or issues are believed to be introduced by the amendments.

In the Office Action, the specification, the drawings and Claims 1 and 7-9 were objected to. The specification, the drawings and Claims 1 and 7-9 have been amended herein in a manner which is believed to obviate the objections. Accordingly, withdrawal of the objections is respectfully requested.

Claims 1, 7 and 9 were rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,370,118 issued to Vij et al. on December 6, 1994 ("Vij et al.").

Independent Claims 1 and 9 have been amended in a manner which is believed to better define Applicants' invention and to overcome the rejection. Claim 1 has been amended to recite "A magnetic resonance imaging apparatus comprising: an RF coil system comprising at least two sets of at least two RF coils for detecting RF signals from a region of interest, at least two receiver channels for receiving and processing the detected RF signals, and a control unit for selectively routing at least one detected RF signal towards separate receiver channels for combining the RF signals of at least two RF coils depending on the imaging parameters and for applying the combined RF signals to separate receiver channels, such that at least two detected RF signals can be combined to form a combined signal and the combined signal is applied to one particular receiver

channel." (Emphasis added) Claim 9 has been amended to recite similar recitations as the recitations added to Claim 1.

Vij et al. does not disclose or suggest at least the newly added limitations to Claims 1 and 9. Vij et al. is directed to a quadrature local coil which includes two coil sets placed on opposite sides of the patient, each coil set having a single loop and a split loop so as to be sensitive to quadrature components of a flux field centered between the coil sets. Figure 5 is a schematic diagram of the coils of the coil sets showing combining of the signals from each coil using combining networks 82 and 86. Vij et al. does not disclose or suggest structure for selectively routing each signal prior to being combined with another signal by either combining network 82 or 86. Each signal is routed along a fixed route, as shown by Figure 5, and combined by either combining network 82 or 86. Figure 5 does not include any switching assembly for selectively routing each signal between two or more routes.

More specifically, Vij et al. does not disclose or suggest structure for and/or the step of selectively routing at least one detected RF signal towards separate receiver channels for selecting and/or combining the RF signals of at least two RF coils depending on imaging parameters and for applying the selected and/or the combined RF signals to separate receiver channels, such that at least two detected RF signals can be combined to form a combined signal and the combined signal is applied to one particular receiver channel, as recited by Applicants' Claims 1 and 9.

Accordingly, withdrawal of the rejection under 35 U.S.C. §102(b) and allowance of Claims 1 and 9 are respectfully requested.

Claim 7 depends from Claim 1, and therefore includes the limitations of Claim 1. Accordingly, for the same reasons given for Claim 1, Claim 7 is believed to contain patentable subject matter. Accordingly, withdrawal of the rejection under 35 U.S.C. §102(b) and allowance of Claim 7 are respectfully requested.

Claims 1-7 and 9 were rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 6,377,044 issued to Burl et al. on April 23, 2002 ("Burl et al.").

Independent Claims 1 and 9 have been amended in a manner which is believed to better define Applicants' invention and to overcome the rejection. Claim 1 has been amended to recite "A magnetic resonance imaging apparatus comprising: an RF coil system comprising at least two sets of at least two RF coils for detecting RF signals from a region of interest, at least two receiver channels for receiving and processing the detected RF signals, and a control unit for selectively routing at least one detected RF signal towards separate receiver channels for combining the RF signals of at least two RF coils depending on the imaging parameters and for applying the combined RF signals to separate receiver channels, such that at least two detected RF signals can be combined to form a combined signal and the combined signal is applied to one particular receiver channel." (Emphasis added) Claim 9 has been amended to recite similar recitations as the recitations added to Claim 1.

Burl et al. does not disclose or suggest at least the newly added limitations to Claims 1 and 9. Burl et al. is directed to a magnetic resonance apparatus which includes a multi-mode receiver assembly which facilitates operation in both a quadrature combination mode and phased array mode. In the quadrature combination mode, two RF signals are combined to produce two signals; each of the two signals produced is applied

to a separate receiver channel, i.e., either channel 1 or 2. The two signals produced are not applied to one particular receiver channel. In the phased array mode, two RF signals are not combined, but delayed with respect to each other and passed separately to the receiver channels. See col. 4, lines 43-59.

Burl et al. does not disclose or suggest structure for and/or the step of selectively routing at least one detected RF signal towards separate receiver channels for selecting and/or combining the RF signals of at least two RF coils depending on imaging parameters and for applying the selected and/or the combined RF signals to separate receiver channels, such that at least two detected RF signals can be combined to form a combined signal and the combined signal is applied to one particular receiver channel, as recited by Applicants' Claims 1 and 9.

Accordingly, withdrawal of the rejection under 35 U.S.C. §102(e) and allowance of Claims 1 and 9 are respectfully requested.

Claims 2-7 depend from Claim 1, and therefore include the limitations of Claim 1. Accordingly, for the same reasons given for Claim 1, Claims 2-7 are believed to contain patentable subject matter. Accordingly, withdrawal of the rejection under 35 U.S.C. §102(e) and allowance of Claims 2-7 are respectfully requested.

Claim 8 was rejected under 35 U.S.C. §103(a) as being unpatentable over Burl et al. as applied to Claims 1-7 and 9 above, and further in view of Pruessmann et al., article titled, "SENSE: Sensitivity encoding for Fast MRI," Magnetic Resonance in Medicine, vol 42, pages 952-962, 1999 ("Pruessmann et al.").

Claim 8 depends from Claim 1, and therefore includes the limitations of Claim 1. Accordingly, for the same reasons given for Claim 1, Claim 8 is believed to contain

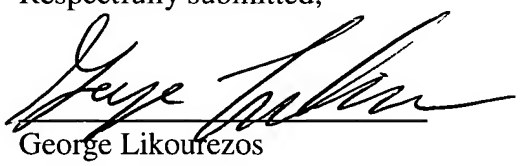
patentable subject matter. Accordingly, withdrawal of the rejection under 35 U.S.C. §103(a) and allowance of Claim 8 are respectfully requested.

In view of the foregoing amendments and remarks, it is respectfully submitted that all claims presently pending in the application, namely, Claims 1-9, are believed to be in condition for allowance and patentably distinguishable over the art of record.

Attached hereto and identified as VERSION WITH MARKINGS TO SHOW CHANGES MADE is a copy of the portion of the specification and the claims detailing the amendments made thereto.

If the Examiner should have any questions concerning this communication or feels that an interview would be helpful, the Examiner is requested to call John Vodopia, Esq., Intellectual Property Counsel, Philips Electronics North America, at 914-333-9627.

Respectfully submitted,



George Likourezos
Reg. No. 40,067
Attorney for Applicants

Mailing Address:
Intellectual Property Counsel
Philips Electronics North America Corp.
580 White Plains Road
Tarrytown, New York 10591

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION:

Paragraph on page 7, lines 3-5 with the following:

Figure [10] 7 shows the arrangement of preamplifiers 50, phase shifters 51, software controlled switches 52 and RF adapters/combiners 53 for four receiver channels C1, C2, C3, C4 and eight RF coils 21 to 28 as used in the embodiment of Figure 6.

Paragraph on page 2, lines 8-16:

This object is achieved by a magnetic resonance imaging apparatus as claimed in claim 1, comprising:

an RF coil system comprising at least two sets of at least two RF coils for detecting RF signals from a region of interest,

at least two receiver channels for receiving and processing the detected RF signals, and

a control unit for selecting and/or combining the RF signals of at least two RF coils [in dependence] depending on the imaging parameters and for applying the selected and/or the combined RF signals to separate receiver channels.

Paragraph on page 3, lines 1-3:

In contrast therewith, according to the invention a variable, preferably software-controlled control unit is provided for selecting and/or combining the RF coils, i. e. the phased array/synergy coils, [in dependence] depending on the imaging parameters.

Paragraph on page 4, lines 3-6:

According to another aspect of the invention said control unit is provided for selecting and/or combining the RF signals of at least two RF coils in dependence on the phase encoding direction or, according to still another aspect of the invention, [in dependence] depending on the desired SENSE reduction direction.

Paragraph on page 4, lines 7-16:

The object is also achieved by a magnetic resonance imaging method as claimed in claim 9, comprising the steps of:

detecting RF signals from a region of interest while using an RF coil system comprising at least two sets of at least two RF coils,

receiving and processing the detected RF signals while using at least two receiver channels and selecting and/or combining the RF signals of at least two RF coils [in dependence] depending on the imaging parameters and applying the selected and/or the combined RF signals to separate receiver channels. It is to be understood that this method can be developed further and that further versions are feasible which are compatible with or similar to those described with reference to the MRI apparatus as claimed in claim 1.

Paragraph on page 6, line 29 to page 7, line 2:

According to the invention some RF coils will be combined into one receiver channel [in dependence] depending on the desired foldover direction, which combination is controlled preferably by appropriate software. If the desired reduction direction is the AP direction, four pairs of RF coils are formed, each pair comprising two RF coils; the

RF signals of the coils 21 and 24, 22 and 23, 25 and 28, 26 and 27 are thus combined as can be seen in Figure 6. If, as an alternative, the desired reduction direction is the LR direction, the RF signals of the coils 21 and 22, 23 and 24, 25 and 26, 27 and 28 are combined according to the invention.

IN THE CLAIMS:

1. (Amended) A magnetic resonance imaging apparatus comprising:

an RF coil system [(9, 10, 11, 12)] comprising at least two sets of at least two RF coils for detecting RF signals from a region of interest,

at least two receiver channels [(C1, C2)] for receiving and processing the detected RF signals, and

a control unit [(51, 52, 53; 31)] for selectively routing at least one detected RF signal towards separate receiver channels for [selecting and/or] combining the RF signals of at least two RF coils [in dependence] depending on the imaging parameters and for applying the [selected and/or the] combined RF signals to separate receiver channels, such that at least two detected RF signals can be combined to form a combined signal and the combined signal is applied to one particular receiver channel.

2. (Amended) A magnetic resonance imaging apparatus as claimed in claim 1, wherein said control unit [(51, 52, 53; 31)] is provided to combine the RF signals of several groups of at least two RF coils into a separate receiver channel.

3. (Amended) A magnetic resonance imaging apparatus as claimed in claim 1, wherein said RF coil system [(9, 10, 11, 12)] comprises two sets of four RF coils.

4. (Amended) A magnetic resonance imaging apparatus as claimed in claim 3, wherein said RF coil system [(9, 10, 11, 12)] comprises a birdcage head coil arrangement.

5. (Amended) A magnetic resonance imaging apparatus as claimed in claim 4, wherein said control unit [(51, 52, 53; 31)] is provided to combine the RF signals of RF coils arranged on opposite sides of the head.

6. (Amended) A magnetic resonance imaging apparatus as claimed in claim 4, wherein said control unit [(51, 52, 53; 31)] is provided to combine the RF signals of neighboring RF coils.

7. (Amended) A magnetic resonance imaging apparatus as claimed in claim 1, wherein said control unit [(51, 52, 53; 31)] is provided to select and/or combine the RF signals of at least two RF coils [in dependence] depending on the phase encoding direction.

8. (Amended) A magnetic resonance imaging apparatus as claimed in claim 1, wherein said control unit [(51, 52, 53; 31)] is provided to select and/or combine the RF signals of at least two RF coils [in dependence] depending on the desired SENSE reduction direction.

9. (Amended) A magnetic resonance imaging method, comprising the steps of:

detecting RF signals from a region of interest while using an RF coil system [(9, 10, 11, 12)] comprising at least two sets of at least two RF coils,

receiving and processing the detected RF signals while using at least two receiver channels [(C1, C2)], and

selectively routing at least one detected RF signal towards separate receiver channels for [selecting and/or] combining the RF signals of at least two RF coils [in dependence] depending on the imaging parameters and applying the [selected and/or the] combined RF signals to separate receiver channels, such that at least two detected RF signals can be combined to form a combined signal and the combined signal is applied to one particular receiver channel.